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(54) Abstract Title
**Disengagement device for vehicle clutch**

(57) The device 1 consists of a sliding sleeve 2 with a release bearing 5. The bearing is axially displaceable and deflects a diaphragm spring 21 which controls the engagement and disengagement processes of the clutch. In the device there are two areas 18,20 which have complementary spherical segments and which are provided on the diaphragm spring and between the diaphragm spring and the release bearing. The areas forming the spherical segments are radially displaceable t wards the release bearing. Surface 24 may be on a s parate compensating ring (figures 2 and 3) made of plastics material, preferably glass fibre reinforced polyamide, which has snap-fitted noses 24 which engage the diaphragm spring tongues.

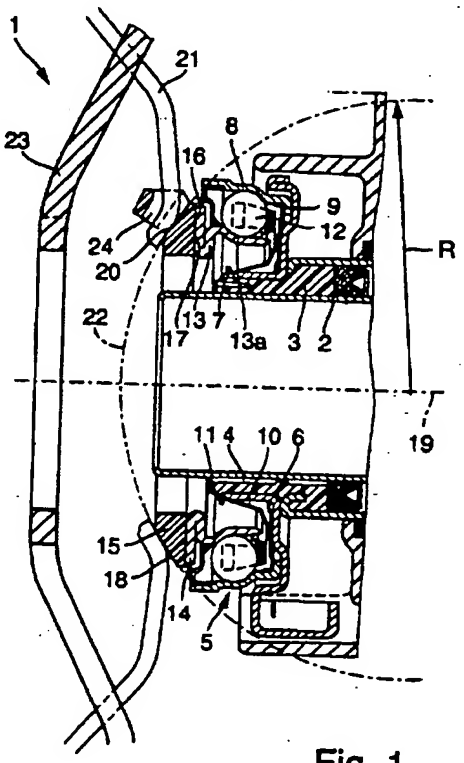


Fig. 1

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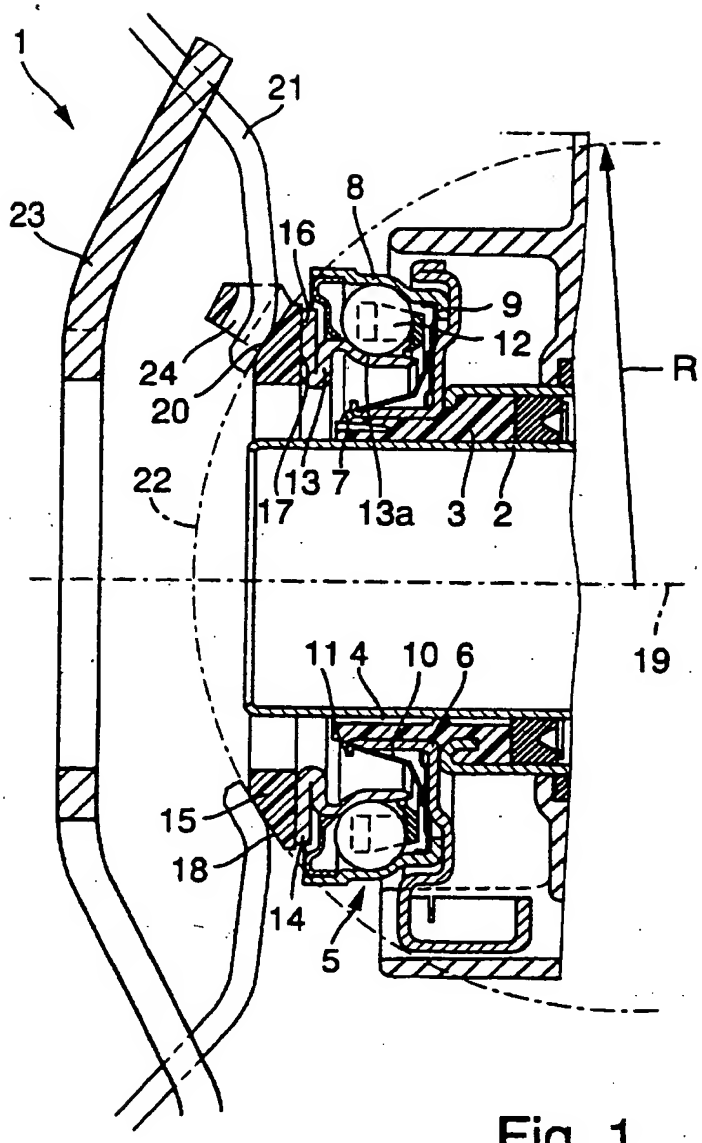


Fig. 1

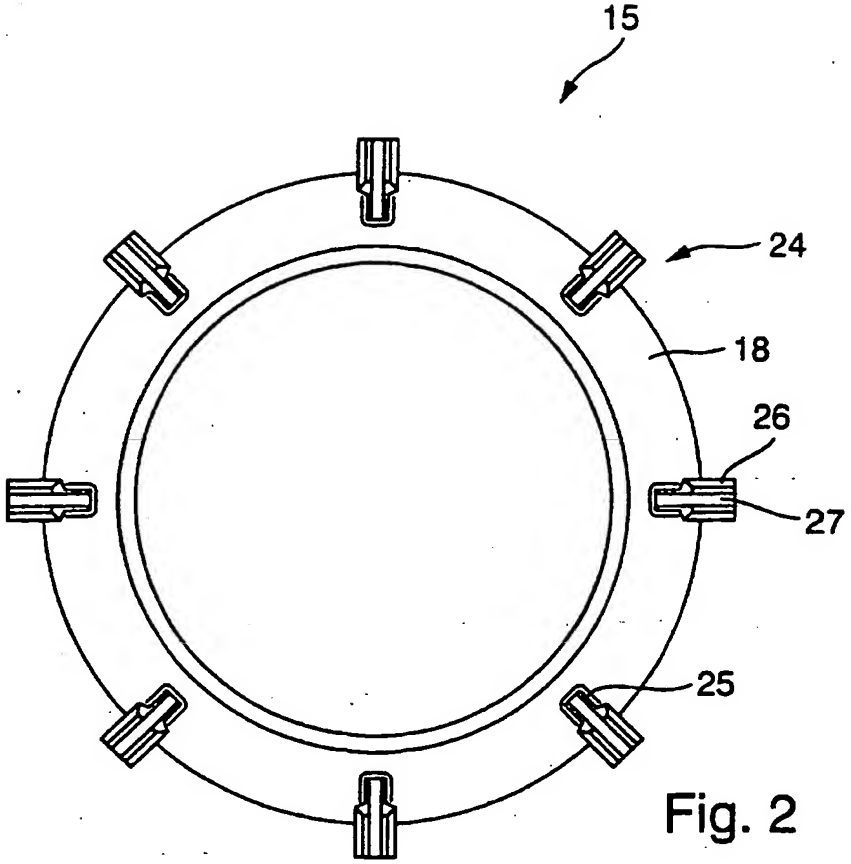


Fig. 2

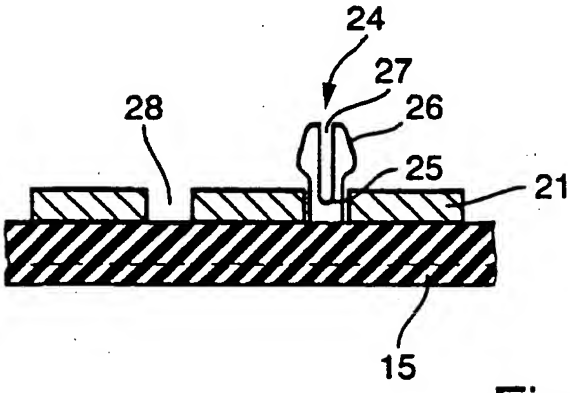


Fig. 3

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# DISENGAGEMENT DEVICE

The invention relates to a release bearing for a clutch preferably in motor vehicles.

Devices of this structural type generally consist of at least one release bearing which is mounted rotationally rigid on an axially displaceable sliding sleeve and which by means of a circumferential flange part which is formed as a contact pressure plate axially deflects a diaphragm spring which controls the engagement and disengagement of the clutch.

The axial displacement takes place through a disengagement lever or a central disengagement member wherein the disengagement movement can be introduced by means of a clutch pedal or automatically by means of a clutch actor.

The construction of the release bearing corresponds substantially to that of an axial bearing or an inclined ball bearing wherein each bearing ring has an angled flange part mounted at right angles to the axis of symmetry of the release bearing. A bearing ring is thereby connected rotationally rigid through the flange part to the axially displaceable operating member. The diaphragm spring tongues or disengagement lever of the clutch is supported on the flange part of the circumferential bearing ring which is aligned towards the clutch.

In the installed state the release bearing can be exposed to a so-called tongue shock, eg to an axial shock of the diaphragm springs which increases the wear on the release bearing and thus leads to a reduction in the service life.

This axial shock which is a condition of the manufacturing process and is caused inter alia by clutch diaphragm springs leads in the case of the disengagement systems previously mentioned to sealing problems and loss of comfort.

Furthermore the two drive components which are separated by the clutch can have an axially parallel stagger between the force-transferring shafts which has to be compensated by a self-centring of the release bearing parallel to the force-transferring shaft since otherwise the release bearing is exposed to increased wear and vibrations increase the loss of comfort.

Various proposals have been put forward to compensate or balance a disadvantageous tongue shock of the kind mentioned and the axial stagger of the force-transferring shafts.

DE U 72 45 141 discloses a release bearing assembly wherein a compensating ring is provided between the spring tongues of the diaphragm spring and the inner ring of the release bearing. The contact bearing face is formed spherical between the inner ring and compensating ring whereby the compensating ring can be displaced and thus aligned relative to the inner ring of the release bearing. A drawback with this proposed solution is inter alia a lack of a radial axially parallel compensation in the form of a radial self centring so that a stagger between the force-transferring shafts cannot be produced. Therefore a release bearing of the type disclosed tumbles about the spherical centre point of the ball-shaped centring ring since the release bearing is only mounted at this axial height by means of an elastic ring so that even here irregular running and associated vibrations are to be

expected. A radial stagger of the compensating ring relative to the compensating bearing is not proposed so that the axial shock can only be compensated through an angular displacement of the release bearing itself.

The object of the invention is therefore to design a disengagement device so that compensation of the tongue shock of the diaphragm spring tongues is possible without additional devices on a release bearing and without an angular stagger of the release bearing opposite the axis of rotation.

This is achieved through a disengagement device for a clutch, preferably for motor vehicles, which consists at least of a release bearing mounted on a sliding sleeve and a diaphragm spring causing the engagement and disengagement processes of the clutch, whereby between the diaphragm spring and the release bearing there are two areas having complementary ball face segments and both are provided directly or indirectly on the diaphragm spring and the areas having the ball face segments are radially displaceable relative to the release bearing.

The component parts having the ball face segments are preferably able to swivel relative to each other from the axis of rotation whereby a compensation of the tongue shock of the diaphragm springs is initially possible. The swivel area of the areas having the ball segments lies preferably between the angles ß = ±10°, preferably ß= ± 1.5°.

The subject of the invention can advantageously be designed so that it is free of the effect of the resetting forces which act on the areas having the ball face segments. Such effects particularly occur when elastic or

non-elastic stops are used to restrict the swivel area of the two areas having the ball face segments. The disengagement devices according to the invention can advantageously be provided without these said stops.

A design according to the invention proposes the formation of the first area having a ball face segment whereby this is formed directly on the diaphragm spring tongues. To this end the radially inwardly aligned diaphragm spring tongues can be provided with the ball segment shaped profiled section during the production process by way of example through pressing, cold-forming, deep-drawing or the like - and where applicable treated with a subsequent hardening process - whereby it can be advantageous to imprint the ball segment in the direction of the clutch bell or in the direction of the release bearing. The complementary area having a ball face segment is then formed accordingly.

As the component which has the second ball face segment which is complementary with the first ball face segment it is possible to provide advantageously a compensating ring which can be mounted axially between the diaphragm spring and a flange part which is provided as a contact pressure plate of the release bearing wherein the compensating ring is structurally separate from the release bearing or can be fixed on component parts of the disengagement device secure against loss. A connection with non-revolving structural parts of the clutch, for example the clutch bell or the like can also be advantageous whereby the compensating ring is mounted and/or centred on this structural part.

According to the invention it is further advantageous to connect the compensating ring to the diaphragm spring

secure against loss. This has the advantage that a conventional release bearing can be used without further adaptation whereby the compensating ring and the flange part lie substantially flat on each other on their axially facing sides but can be displaced radially relative to each other.

The non-detachable fixing of the compensating ring on the diaphragm spring can be advantageously achieved through fastening means of the compensating ring which engage in gaps which separate the radially inwardly extending diaphragm spring tongues of the diaphragm spring. Advantageously at least two or more snap-fit noses are provided spread evenly over the circumference and engaging through the gaps between the diaphragm spring tongues. The snap-fit noses can be mounted in an embodiment according to the invention on the ball face segment. To secure the non-detachable fitting it is advantageous to provide a ball-shaped area on the snap-fit noses at their end remote from the compensating ring whereby the passage of the ball shaped snap-fit noses through the gaps can be made easier by an elastic design of the ball-shaped areas. A further embodiment is the formation of preferably central slits in the ball shaped ends of the snap-fit noses which as they press through the gaps allow the ends to compress which then spring back to their original shape. Here it is expedient to provide the slits in the direction of the path of the slits formed by the diaphragm spring tongues and to select an approximately conical shape at the ends so that after the snap-fit noses snap in, the wide cone base forms a stop for the diaphragm spring tongues.

In order to avoid high wear on the compensating ring and with a suitable choice of material for the compensating

ring at the diaphragm spring tongues it is advantageous to select the diameter of the necks of the snap-fit noses so that the diaphragm spring tongues which change the gap widths of the gaps formed between same during the course of their axial operating movement do not restrict the snap-fit noses, i.e. the diameter of the snap-fit noses is advantageously smaller than the minimum gap width during the entire axial operating stretch of the diaphragm spring since otherwise increased undefined wear and difficult running of the clutch would occur.

An advantageous design of the subject of the invention provides materials for the compensating ring which allow rapid production techniques with high numbers, by way of example an injection casting process. A plastics is preferably used here which in this area is thermally and mechanically resistant, such as for example polyamide with or without glass fibre reinforcement.

Furthermore an embodiment is advantageous having a radially self-adjusting release bearing which can compensate independently of the tongue shock of the diaphragm spring a stagger of the force-transferring axes, that is this embodiment can with the means according to the invention compensate on the one hand an angular stagger acting on the release bearing, caused inter alia by a tongue shock and/or unevenly mounted clutch cover and on the other hand a parallel stagger of the force-transferring shafts for example caused by non-central mounting.

The invention will now be explained with reference to Figures 1 and 2 in which:

Figure 1 shows a sectional view through an embodiment of the subject of the invention;

Figure 2 is a view of a compensating ring; and

Figure 3 is a partial view of a compensating ring with diaphragm spring tongues placed thereon in the direction of the arrow in Figure 1.

Figure 1 shows a disengagement device 1 consisting of a sliding sleeve 2 connected rotationally rigid to the gearbox housing (not shown) and mounted about a gear input shaft (not shown). A disengagement piston 3 of a central disengagement member (not shown in further detail) is mounted rotationally rigid but axially displaceable on the sliding sleeve. To reduce the friction forces during axial displacement the disengagement piston 3 is provided on its inner circumference with axially aligned grooves 4. A release bearing 5 is mounted around the disengagement piston 3 and is connected by the bearing ring 6 rotationally rigid to the disengagement piston 3 and is fixed in the axial direction by means of a snap-fit closure 7 provided on the end of the disengagement piston 3 pointing in the direction of the clutch. A bearing shell 8 is supported in the axial direction on the bearing ring 7 and is centred against the action of the spring 9. A further spring 10 is supported on the radially outwardly curved flange 11 of the bearing ring 6 and on the spring 9 so that the bearing shell 8 as well as the rolling bodies 12 adjoining same radially inwards and the radially adjoining circumferential flange part 13 forming the bearing shell 13a are displaceable radially against the spring forces of the springs 9, 10. In this way with slight axial pretension of the release bearing a radial stagger is possible parallel to the gear input shaft and thus a compensation of the stagger is possible between the

gear input shaft and a drive shaft (not shown) which in non-compensated cases causes turning irregularities on the disengagement devices and their following structural parts by way of example the disengagement member, pedals, hydraulic devices etc.

In this way the release bearing 5 is adjusted with slight axial pretension whilst with greater pretension during the engagement and disengagement processes the bearing shell 8 is pressed against the bearing ring 6 and therefore the adjusted radial position remains set.

The flange part 13 has in the direction remote from the rolling bodies 12 a radially outwardly bent flange 14 which is provided axially flat and forms the contact bearing face 17 for the compensating ring 15 which has in turn an axially approximately flat contact bearing face 16. Both contact bearing faces 16, 17 are displaceable radially relative to each other.

The compensating ring 15 has on its side opposite the contact bearing face 16 a ball-shaped surface segment 18 with radius R which intersects the axis of rotation 19 of the compensating ring 15. The diaphragm spring tongues 21 of the diaphragm spring which is held by the clutch housing 23 and which is not shown in its entirety have at their radially inner ends surface segments 20 which are substantially complementary with the surface segments 18 of the compensating ring 15 wherein the surface segments 18, 20 are displaceable relative to each other on the ball surface 22.

A tongue shock of the diaphragm spring tongues 21 shows itself in that the ball face segment 20 formed by the diaphragm springs 21 no longer adjoins the ball face

segment 18 formed by the compensating ring 15 over the entire circumference. The compensating ring 15 is therefore radially displaced in the direction in which the axial distance from the diaphragm spring tongues is greatest whereby at the same time through the shape of the ball face segments 18 an increase in the axial distance to the diaphragm spring tongues 21 occurs without tongue shock. The axial play thereby arising is imitated by the disengagement piston 3.

The result of the compensation of the tongue shock is for the rotational axis 19 of the compensating ring 15 a radial parallel displacement relative to the axis of rotation of the gear input shaft. A parallel axial stagger between the drive shaft and gear input shaft is compensated by radial displacement of the release bearing 5.

The compensating ring 15 is connected secured against loss to the diaphragm spring tongues 21 by means of snap-fit noses 24.

Figures 2 and 3 show for a more detailed explanation the compensating ring 15 with snap-fit noses 25 spread evenly over the circumference and projecting on the ball face segment 18 substantially at right angles to a tangent placed along the ball segment surface. The snap-fit noses have a neck 25 adjoined by a ball-shaped area 26 which has along the longitudinal extension of the diaphragm spring tongues slits 27 so that when the snap-fit noses pass through the radially inwardly aligned slits 28 which are formed by the diaphragm spring tongues 21 the slit ball shaped areas can be compressed and snap out again after passing through so that by their ball-shaped areas 26

forming stops they fix the compensating ring 15 secured against loss on the diaphragm spring tongues 21.

The width of the slits 28 between the diaphragm spring tongues 21 is changed by axial movements of the diaphragm spring during the engagement and disengagement processes so that the diameter of the necks 25 is matched to the minimum width of the slits 28.

The compensating ring 15 is preferably made by injection moulding plastics, for example glass fibre reinforced polyamide.

The patent claims filed with the application are proposed wordings without prejudice for obtaining wider patent protection. The applicant retains the right to claim further features disclosed up until now only in the description and/or drawings.

References used in the sub-claims refer to further designs of the subject of the main claim through the features of each relevant sub-claim; they are not to be regarded as dispensing with obtaining an independent subject protection for the features of the sub-claims referred to.

The subjects of these sub-claims however also form independent inventions which have a design independent of the subjects of the preceding claims.

The invention is also not restricted to the embodiments of the description. Rather numerous amendments and modifications are possible within the scope of the invention, particularly those variations, elements and combinations and/or materials which are inventive for example through combination or modification of individual

features or elements or process steps contained in the drawings and described in connection with the general description and embodiments and claims and which through combinable features lead to a new subject or to new process steps or sequence of process steps insofar as these refer to manufacturing, test and work processes.

CLAIMS

1. Disengagement device for a clutch preferably for motor vehicles consisting at least of a release bearing mounted on a sliding sleeve and a diaphragm spring associated with the clutch and in active connection with the release bearing, with the following features:

a) two areas having complementary ball face segments are provided between the diaphragm spring and release bearing;

b) both areas having ball face segments are provided directly or indirectly on the diaphragm spring;

c) the areas forming the ball face segments are radially displaceable towards the release bearing.

2. Disengagement device more particularly according to claim 1 and/or 2 characterised in that the two areas having the ball face segments are able to swivel relative to each other.

3. Disengagement device more particularly according to claim 1 characterised in that the component parts having the ball face segments are free of the action of resetting forces acting on the swivel area.

4. Disengagement device more particularly according to one of the preceding claims, characterised in that the two areas having the ball face segments can swivel relative to each other preferably in an angular range of ß = ± 10, preferably ß = ± 1.5 degs.

5. Disengagement device more particularly according to one of the preceding claims, characterised in that the first area having a ball face segment is formed by tongues of the diaphragm spring.

6. Disengagement device more particularly according to one of the preceding claims characterised in that the second area having a ball face segment is formed in a compensating ring mounted axially between the diaphragm spring and a flange part provided as a contact pressure plate of the release bearing.

7. Disengagement device more particularly according to one of the preceding claims characterised in that the compensating ring is separated structurally from the release bearing.

8. Disengagement device more particularly according to one of the preceding claims characterised in that the compensating ring is connected to the diaphragm spring secure against loss.

9. Disengagement device more particularly according to one of the preceding claims characterised in that the compensating ring and the flange part are approximately flat on their axially facing sides and are displaceable radially towards each other.

10. Disengagement device more particularly according to one of the preceding claims characterised in that fastening means of the compensating ring engage in gaps which are formed between the radially inwardly extending diaphragm spring tongues of the diaphragm spring.

11. Disengagement device more particularly according to one of the preceding claims characterised in that the fastening means consist of at least two snap-fit noses mounted on the ball face segment and engaging through the gaps between the diaphragm spring tongues.

12. Disengagement device more particularly according to one of the preceding claims characterised in that the snap-fit noses have a ball shape at their end remote from the compensating ring.

13. Disengagement device more particularly according to one of the preceding claims characterised in that the snap fit noses are elastic.

14. Disengagement device more particularly according to one of the preceding claims characterised in that the snap fit noses are slit at their end remote from the compensating ring approximately in the middle in the direction of the path of the gaps.

15. Disengagement device more particularly according to one of the preceding claims characterised in that the diameter of the snap fit noses is smaller in the area of the passage through the gaps between the diaphragm spring tongues than the smallest gap width of the gaps between the diaphragm spring tongues which appears during the path of an axial displacement of the diaphragm spring.

16. Disengagement device more particularly according to one of the preceding claims characterised in that the compensating ring consists of plastics.

17. Disengagement device more particularly according to one of the preceding claims characterised in that the plastics is reinforced with glass fibre.

18. Disengagement device more particularly according to one of the preceding claims characterised in that the plastics is a glass fibre reinforced polyamide.

19. Disengagement device more particularly according to one of the preceding claims characterised in that the release bearing is radially self-centring.

20. Disengagement device for a clutch substantially as herein described with reference to the accompanying drawings.